

# Science Times

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## From Way on High, Help In Fighting Forest Fires

By WARREN E. LEARY

WASHINGTON, Aug. 18 — Science satellites, launched into orbit for long-term studies of the Earth's climate, are increasingly being used for more immediate purposes like helping firefighters in their battles to contain wildfires.

The satellites, components of NASA's Earth Observing System, continue their primary task of trying to understand the complex interactions among land, air, water and life on the planet that affect climate. But some of the data, instead of being held for months or years for use in scientific research, is being applied almost as soon as it is gathered to practical problems, like improving weather forecasts and monitoring forest fires.

"We are interested in NASA assets being used for scientific research, but also for real-world applications," said Dr. Vincent V. Salomonson, a senior scientist at the agency's Goddard Space Center in Greenbelt, Md.

To further this purpose, he said, the National Aeronautics and Space Administration is developing improved sensors to gather better data and looking at innovative ways to apply them to everyday problems. "We are experimenting with flying satellites in formation to use multiple sensors to monitor things such as fires," said Dr. Salomonson, who is an atmospheric scientist.

While fires burn about four million acres annually in the United States, last year's particularly bad season resulted in more than six million acres of forestland being engulfed. So far this year, more than 41,000 fires have consumed some 2.3 million acres, mostly in Western states, according to the National Interagency Fire Center.

To monitor these fires, data from several NASA spacecraft is being channeled into computer models that update active fire maps several times a day. This data helps fire managers on the ground determine

where to put their resources, pinpointing which areas should be watched more closely by aircraft and where best to position firefighters to contain a blaze, experts said.

NASA, the United States Forest Service and the University of Maryland have combined resources to produce a rapid response system to monitor and map the thousands of forest and brush fires each summer.

Two satellites in this effort are TERRA, launched in 1999 to study the interaction between land and oceans, as well as radiation taken in and given off by the planet, and AQUA, which was orbited in 2002 to look at the continual transfer of water between the atmosphere and the

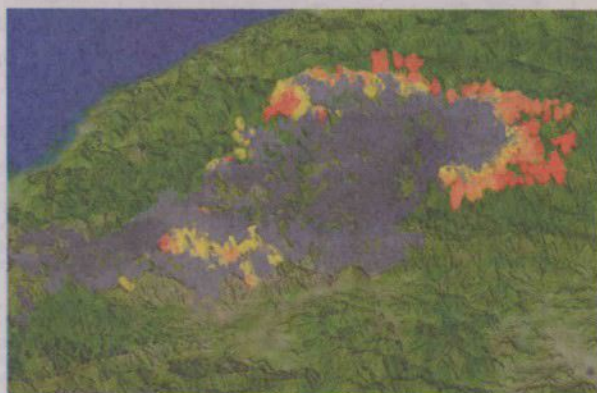
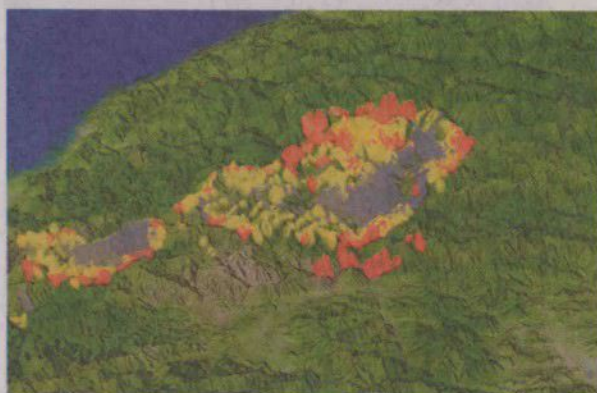
### Orbiting satellites serve earthly purposes.

land and seas.

Both satellites, which are in 438-mile orbits that cross the Earth's poles, contain nearly identical instruments called Moderate Resolution Imaging Spectroradiometers (Modis) that measure multiple bands of visible and infrared radiation. The Modis instruments measure ice and snow cover, vegetation, land surface characteristics, atmospheric aerosol particles and heat from fires.

The satellites make morning and afternoon observations daily of almost every point on Earth, and the Modis instruments keep track of the extent and intensity of fires. They also provide altitude estimates of smoke plumes.

Modis data processed and transmitted at the Goddard center, and computer models and software developed at the University of Maryland to use it, goes into updating active fire maps three to four times a day. The maps and other information, which is shared with a number



Images of the progression of the Biscuit fire, which burned 500,000 acres in Oregon and Northern California in 2002, were gained from satellite instruments.

of government fire monitoring and fighting agencies, are available on <http://activefiremaps.fs.fed.us/index.html> and <http://rapidfire.scisgsc.nasa.gov/>.

To expedite making maps available to help in fighting current fires, the Forest Service built its own receiving station to retrieve Modis data in real time directly at its Remote Sensing Applications Center in Salt Lake City. The center prepares active fire maps three times a day for the entire country.

"Yesterday's fire map has very little value to a fire manager making a decision today," said Thomas J. Bobbe, the center's manager.

However, he said, some satellite imagery is useful after a fire to assess damage and plan recovery efforts. The Forest Service and other land management agencies prepare emergency response plans to stabilize soils, protect water supplies and replant vegetation to prevent erosion and use the satellite data to help determine which areas should be dealt with first, Mr. Bobbe said.

Dr. Christopher O. Justice of the University of Maryland, a member of the Modis instrument science team specializing in application of the data to land issues, said fire had a major impact worldwide. Fires not only greatly impact atmospheric chemistry, he said, but are also a major factor in land use.

While most wildfires are caused by lightning, Dr. Justice said, human activity is a big influence.

"As humans move into an area, you see changes in fire frequency," he said. "There is active deforestation, where people start fires to make and maintain pasture. In other cases, people moving into a forested area, just building more homes and living there, cause a change in fire frequency and the impact of fires."

Monitoring by satellites is a key to understanding the impact of fires, Dr. Justice said. "Fires in Africa produce plumes that go out to Brazil and fires in Brazil the other way," he said. "Smoke spreads the effects to places far away and we have to look at this on a broader scale."

Photographs by NASA/Goddard Space Flight Center Scientific Visualization Studio